

1. An orthodontic appliance for attachment to a tooth, the appliance comprising:
 - a bracket; and
 - a bonding structure configured to provide bonding of the bracket with adhesive to a tooth, the bonding structure being compliantly attached to the bracket so as to resist transmission of impact from the bracket to the adhesive.
- 5 2. The orthodontic appliance of claim 1 wherein the bonding structure includes a mesh.
- 10 3. The orthodontic appliance of claim 1 wherein the bonding structure is attached to the bracket in such a way as to provide compliant movement between the bracket and the bonding structure upon impact to the bracket.
4. The orthodontic appliance of claim 1 wherein the bracket has a base having thereon an inner central portion and an outer peripheral portion in surrounding relation to the inner central portion.
- 15 5. The orthodontic appliance of claim 4 wherein the inner central portion is contiguous with the outer peripheral portion.
6. The orthodontic appliance of claim 4 wherein the bonding structure is attached in at least one point to the outer peripheral portion of the base and is substantially free from attachment to the inner central portion of the base.
- 20 7. The orthodontic appliance of claim 4 wherein the outer peripheral portion comprises a metal sheet.
8. The orthodontic appliance of claim 7 wherein the metal sheet is a foil, the bonding structure being attached in at least one point to the foil.

9. The orthodontic appliance of claim **4** wherein the base comprises a plurality of regions, each region having an inner central portion and an outer peripheral portion, the bonding structure being attached in at least one point to the outer peripheral portion of more than one region.

5 10. The orthodontic appliance of claim **4** wherein the appliance further comprises a pad fixed to the base having thereon the inner central portion and the outer peripheral portion in surrounding relation to the inner central portion.

11. The orthodontic appliance of claim **10** wherein the pad comprises a foil, the bonding structure being attached to the foil.

10 12. The orthodontic appliance of claim **10** wherein the bracket is a metal bracket.

13. The orthodontic appliance of claim **10** wherein the bonding structure is a wire mesh.

14. The orthodontic appliance of claim **10** wherein the bonding structure
15 is attached in a plurality of points to the outer peripheral portion of the pad.

15. The orthodontic appliance of claim **1** wherein the bracket comprises a material selected from the group consisting of a metal, a ceramic and a plastic.

16. An orthodontic appliance for attachment to a tooth, the appliance comprising:

a bracket having a base, the base having thereon an outer peripheral portion and an inner central portion; and

5 a mesh having an attachment to the outer peripheral portion and substantially free from attachment to the inner central portion, the attachment providing compliant movement between the inner central portion and the mesh upon impact.

10 **17.** The orthodontic appliance of claim **16** wherein the bracket is formed of a material selected from the group consisting of a metal, a ceramic and a plastic.

18. The orthodontic appliance of claim **16** wherein the bracket and the mesh are each formed of metal and the attachment includes a weld joining the mesh to the base around the outer peripheral portion.

15 **19.** The orthodontic appliance of claim **16** wherein the outer peripheral portion is contiguous with the inner central portion.

20 **20.** The orthodontic appliance of claim **16** wherein the base comprises more than one region, each region having an inner central portion and an outer peripheral portion, the mesh being attached to the outer peripheral portions of more than one region.

21. The orthodontic appliance of claim **16** wherein the base includes a pad formed of a metal sheet having thereon the outer peripheral portion surrounding the inner central portion on one side of the sheet;

25 the bracket includes archwire support structure fixed to the pad on one side thereof opposite the inner central portion; and

the attachment including a weld of the mesh to the outer peripheral portion of the pad.

22. The orthodontic appliance of claim 21 wherein the pad is a foil.
23. The orthodontic appliance of claim 21 wherein the mesh is attached in a plurality of points to the outer peripheral portion of the pad.

24. An orthodontic appliance for attachment to a tooth, the appliance comprising:

- a bonding structure for bonding the appliance to a tooth with adhesive;
- an external surface extending from the bonding structure and exposed

5 to impact from an external object against the external surface; and

- a resilient interface on the appliance between the tooth and the object.

25. The orthodontic appliance of claim **24** wherein the interface is between the adhesive and said external surface.

26. The orthodontic appliance of claim **24** wherein the interface is between

10 the bonding structure and the object.

27. The orthodontic appliance of claim **24** wherein:

- the external surface and the bonding structure are made of metal; and
- the interface is between the bonding structure and the external surface.

15 **28.** The orthodontic appliance of claim **24** wherein:

- the appliance is made of ceramic; and
- the interface is between the external surface and the object.

29. The orthodontic appliance of claim **24** wherein:

- the interface is between the bonding structure and the tooth.

20 **30.** The orthodontic appliance of claim **29** wherein:

- the interface includes a resilient coating on the bonding structure between the bonding structure and adhesive that bonds the appliance to a tooth.

31. The orthodontic appliance of claim **24** wherein the interface is between the external surface and the bonding structure.

32. The orthodontic appliance of claim **31** wherein:
the interface includes a resilient bracket fixed to the bonding structure.
33. The orthodontic appliance of claim **24** wherein:
the external surface is tapered so as to deflect an impacting object.
- 5 34. The orthodontic appliance of claim **24** further comprising:
a second external surface extending from the bonding structure, the
second external surface being tapered so as to deflect an impacting object.
- 10 35. The orthodontic appliance of claim **24** further comprising:
adhesive between the bonding structure and the tooth, the adhesive
having a low modulus of elasticity.
36. The orthodontic appliance of claim **24** further comprising:
adhesive between the bonding structure and the tooth, the adhesive
having an elongation-to-failure of substantially less than 3 percent.

37. A method of attaching to a tooth to resist impact, an orthodontic appliance having an external surface exposed to impact from an external object, the method comprising:

5 providing an orthodontic appliance including a bracket having a bonding structure for bonding the appliance to a tooth and a resilient interface on the appliance between the tooth and the object;

providing adhesive to mechanically bond the structure to a tooth; and mechanically bonding the bonding structure to the adhesive to attach the orthodontic appliance to the tooth.

10 38. The method of claim 37 wherein the bonding structure is a mesh.

39. The method of claim 37 further comprising:

providing a compliant element to the appliance configured to resist transmission of impact from the bracket to the adhesive.

15 40. The method of claim 37 wherein the providing of the appliance further comprises:

providing a bracket formed of a material selected from the group consisting of metal, ceramic and plastic.

20 41. The method of claim 37 wherein bracket has a base having an outer peripheral portion attached in at least one point to the bonding structure and an inner central portion substantially free from attachment to the structure.

42. The method of claim 41 wherein:

the peripheral portion comprises a metal sheet.

43. The method of claim 42 wherein:

the metal sheet is foil;

25 the bonding structure is a mesh that is attached to the foil.

44. The method of claim 37 wherein the mesh is attached to a plurality of points on the outer peripheral portion of the base.

45. A method of constructing an impact resistant orthodontic appliance for attachment to a tooth, the method comprising:

providing a bracket having a base, the base having an inner central portion and an outer peripheral portion;

5 attaching a bonding structure in at least one point to the outer peripheral portion of the base; and

providing that the bonding structure is substantially free from attachment to the inner central portion of the base to allow compliant movement between the base and the bonding structure upon impact.

-10 **46.** The method of claim **45** wherein the bonding structure is a mesh.

47. The method of claim **45** wherein the outer peripheral portion of the base comprises a metal sheet.

15 **48.** The method of claim **47** wherein the metal sheet is a foil and the bonding structure is a mesh, the mesh being attached to at least one point on the foil.

49. A method of constructing an impact resistant orthodontic appliance for attachment to a tooth where the appliance includes a bracket having structure vulnerable to impact from an external object, the method comprising:

5 providing bonding structure to the bracket for mechanical bonding of the bracket to the tooth; and

providing a compliancy on the appliance for resisting impact between the tooth and the object.

50. The method of claim **49** wherein the compliancy includes an adhesive of unconventionally low elastic modulus between the bonding structure and the 10 tooth.

51. The method of claim **49** wherein the compliancy includes an elastomeric coating on the bonding structure.

52. The method of claim **49** wherein the compliancy includes an elastomeric coating on an external surface of the bracket.

53. A method of constructing an orthodontic appliance for attachment to a tooth where the appliance has an external surface vulnerable to impact from an external object, the method comprising:

5 providing bonding structure having the external surface thereon and a bonding member adapted to mechanically bond the structure to the tooth; and
providing compliancy on the appliance to resist impact between the tooth and the object.

54. The method of claim **53** wherein providing the bonding structure having the bonding member includes attaching a mesh to the bonding structure.

10 **55.** The method of claim **53** wherein providing the bonding structure having the bonding member includes attaching a mesh having an elastomeric coating to the bonding structure.

15 **56.** The method of claim **53** wherein providing the bonding structure having the bonding member includes attaching a tapered base to the bonding structure.

57. An orthodontic appliance for attachment to a tooth where the appliance has an external surface exposed to impact from an external object against the external surface; and, the appliance comprising:

- 5 a bonding structure for bonding the appliance to a tooth with adhesive,
- the external surface extending from the bonding structure; and
- the external surface being tapered so as to deflect an impacting object.

58. The method of claim 57 wherein:

- 10 the bonding structure includes a base having a tapered surface complementing the taper of the external surface so as to enhance deflection of an impacting object.